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ABSTRACT

Activities undertaken during the initial phase of Project LEARN at Beloit College are described. Following a summary of the consensus of student opinions about college-level learning which arose out of weekly discussion groups, the author presents a description of SELFDRill, a learning utility program which is designed to convert a PDP-8 minicomputer into an automated drill master and to encourage students to look for new things to learn. The reactions of learners to SELFDRill are explored and its pedagogical implications examined, with particular attention paid to SELFDRill's ability to make learning a learner-initiated experience. A critique of the learning environment at Beloit is presented, along with a consideration of the possible applications of Project LEARN at the College. A humanities-oriented analysis of current computer-assisted instructional efforts is given. The report concludes with some information about the dissemination of SELFDRill and plans for its further development. (PB)

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FINAL REPORT ON THE FIRST PHASE OF THE LEARN PROJECT

THE DEVELOPMENT OF SELFDRILL

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I would also like to acknowledge the critical contribution of my wife Cynthia, whose sensitivity to the project's goals and lucid editorial skill (and patience with my unearthly working hours!) have improved the substance and cogency of this report.

Final Report on First Phase of LEARN Project

The Development of SELFDRill

In September of 1972, Beloit College was awarded a grant of $19,800 to begin development of "a humanities-oriented approach to use of the computer as a learning tool." The present report is an attempt to summarize the activities and results of the first phase of the effort as defined by the terms of this grant.

There were three main aspects to the initial effort, (1) the actual task of producing and publishing SELFDRill; (2) the effort to engage in dialogue about the problems of independent learning, especially in the humanities; and (3) the formulation of specific plans for the follow-on effort. No attempt was made to isolate these three goals from each other, since they are so closely related. The last of these can speak for itself: a follow-on proposal has been approved by the Foundation. Since "engaging in dialogue" is inherently a less specific goal, it seems appropriate to explain in greater detail exactly what was involved.

THE DIALOGUE WITH LEARNERS:

During the past year a small group of Beloit College students met with me regularly each Sunday evening to explore the possibility of using a mini-computer to enhance their own learning experience in the study of language and literature. The discussions centered on some of the most basic problems of college-level learning as experienced by the students themselves. The consensus of these discussions included the following points:

1. Most college classes offer little or no help to the student in the learning effort. Students go to class to find out what they are supposed to learn or to demonstrate what they have learned, but seldom to learn.

2. Learning in college involves a great deal of reading, and the computer can hardly change this fact. However, mere reading (without looking for something specific) is often ineffective.

3. Even with formal class direction, one of the biggest problems for the student is figuring out what are the important things to learn.

4. In many subjects, the learner faces an initial period of disorientation during which he feels overwhelmed by a mass of seemingly unrelated details. Often this bewilderment is consciously related to a new terminology pertaining to the discipline, a terminology which the neophyte finds almost a foreign language.

5. Learning is not a smooth linear progression of understanding, but seems more like a series of steps and plateaus. There is a certain kind of swift insight, when the interrelationships between a number of seemingly unrelated items suddenly becomes clear; the subject (or some phase of it) "makes sense." The students liked to think of this as the apprehension of a "logical model" in terms of which the various details of the subject could be organized.

6. Especially during the early stages of exposure to a subject, it is valuable to have clear-cut, easily-applied procedures to follow in one's study. Such habits as note-taking, underlining or otherwise marking a text, use of the dictionary, and formulation of questions were mentioned.

7. Every student seems to have trouble remembering certain things. Such "mental blocks" often seem to determine the entire character of the student's learning experience in a given subject.

8. The need for feedback during the study period is constant and crucial. Even when the student is aware that the computer is a mere machine, the psychological effect of the approving comment it displays is very helpful. Such comments seem to serve as a kind of social recognition of the learner's efforts.

9. "Human engineering" of the computer-based learning aid is all important. Ease and naturalness of communication is probably the most significant factor in the success of such aids.

10. Quite apart from any consideration of the computer, the students agreed that far too much of their study effort is presently wasted in mechanical tasks--the process of looking up unfamiliar words in the foreign-language dictionary, for example, or the process of typing an acceptable-looking term paper.

11. Generally, these students were apathetic or negative in their feelings about computer-based "instruction." They were much more interested in directing their own study experience than in being led along some tried-and-true logical path to the coherent understandings of someone else's model of the subject. This bias could have been due to the nature of these particular students' interests: literature, linguistics, philosophy, anthropology, Greek and Latin. But one of the students did have a major interest in the sciences, and this did not differentiate her reaction from the rest as far as the nature of the learning experience was concerned. It seems more reasonable to say that this particular group of students were biased toward self-directed study. As volunteers familiar from the outset with the project's goals, they constituted an elite group of independent students, sufficiently intelligent and dedicated to seek applications of the computer consistent with their own style of learning.

Perhaps the most salutary thing about this group was its awareness of its own limitations. The students did not pretend to be able to speak for their peers; but they could indeed speak each for himself.

After an initial period of familiarization with the computer system available to the project, these students took turns being in charge of a series of "brainstorming" type sessions (modelled after a simple little group process described by George Prince in The Practice of Creativity, which we all agreed to follow for procedural convenience). At the same time, each of the students was regularly involved in typing up, editing, assembling, and debugging the subroutines basic to the program under development. Several of the students actually wrote or revised certain of

these routines. But more important, some of them were usually on hand while details of the program were in process of being determined; and as often as not, one or another of them would cast the deciding vote where alternative drill procedures were in question.

Ultimately the group decided that our goal was to create a learning tool so intriguing that it would tempt the user to look for things to learn; one which was as adaptable as possible to the individual user's needs and personal characteristics; and of course, one which was truly effective in use. How well the SELFDRill program meets these criteria is still under critical investigation; but it is fair to say that the students who played a part in its development are pleased with it. Moreover, the discussions were inherently broader in scope than the SELFDRill program by itself could possibly reflect. This year's work was thus truly introductory to the entire development of the LEARN package. Since most of the students involved plan to continue working on the project, this exploratory dialogue provides a useful background for future program development.

DESCRIPTION OF SELFDRill

The specific result of the past year's effort, however, has been the creation of a learning utility program (SELFDRill) of broad application in various subjects, and its publication as DECUS program number 8-656. The program has been used here at Beloit College this fall with encouraging results, and additional versions are under development for use with more sophisticated hardware such as the VT05 visual display terminal and on-line magnetic storage.

Briefly, this program turns any PDP-8 mini-computer into an automated drill-master. The user may introduce a series of items in the format

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CUE 1/RESPONSE 1
CUE 2/RESPONSE 2
CUE 3/RESPONSE 3    (and so on)
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into the file. The program will present each of the cues and

expect active recall of the associated responses. Each response is monitored and evaluated, and records are kept of the learner's performance on each item. On the basis of these records, items are presented repeatedly at intervals designed to strengthen the user's ability to recall each of them immediately and correctly. When the learner's performance on a given item indicates an assured and consistent ability to recall the item, he is "tested out" on it. If this test is successful, the item is deemed "learned" and will no longer appear in the presentation sequence. Provision is also made for the consistent review of items learned in previous sessions.

The heart of the drill program is the formula which determines the priority of presentations. This formula is purely pragmatic, and is based on five major variables: (1) successful recall (if unsuccessful, the item is presented again very shortly); (2) the interval of successful recall (as measured by the number of intervening items since the last exposure to this one); (3) the consistency of (recent) correct responses; (4) the "response time" for the current exposure (in comparison with the user's own current average response time); and (5) the presence or absence of a special signal from the keyboard which represents the user's feeling of confidence in his response.

In the presentation of each item, the program affords a high degree of assistance whenever the user is unsure of the answers. He has several options when he does not know which letter to type:

1. He can make an intelligent guess. If wrong, the computer will ring the teletype bell to warn him of his error, and he may then either hit the rubout key and then try another letter, or wait for the computer to indicate what the correct letter should have been. Type out will proceed automatically at a slow pace (which the user can adjust), and the user can interrupt this type out by beginning to type the remainder of the answer at any point in the type out. Letters typed out slowly by the program are counted as "hints." This hint count is reported as part of the machine's evaluation of each response.

2. He can t a question mark as his input. This will not be printed, but instead the character expected for this response will be printed out. He may repeat the question mark signal as often as he wishes until the correct response has been displayed, or he can proceed to type the remainder of the answer after displaying one or more of the initial characters of it as "hints."

3. He can simply wait, trying to recall the response. After a brief pause (about eight seconds), the program will begin its automatic type-out of the response. As already indicated, the user can over-ride this automatic type out by typing the correct response before the machine does so.

The effect of this timing is to force the user into a fairly brisk drill rate. He may of course terminate the drill at any point simply by tapping the space bar; but as long as he chooses to go on with the drill, he will experience a sense of expectation of the part of the machine which demands and rewards his attention. If he is too slow, the program may remark on his slowness--or will assume he doesn't know the answer and type it for him. If he responds more quickly than usual, the program may remark on his promptness. In addition, the program marks the user's relative progress toward test-out on each item at each presentation by typing one or more asterisks as part of its report. The user soon realizes that the asterisks constitute sort of a "figure of merit" of his current performance on a given item.

This performance climate distinctly includes the expectation that the user will express confidence in his own performance. As soon as the program determines that his response on a given item is reasonably consistent in its correctness, and reasonably prompt, it begins to expect him to assert confidence in his knowledge. He does so by typing the "I AM SURE" signal (the ALT MODE key) before proceeding to type his answer. He is rewarded for using this key correctly (the program usually types all of the response after he supplies the correct initial letter), penalized for using it incorrectly (if his response after using the confidence

key indicates uncertainty of the correct answer, the program "loses confidence" in his assertion of confidence, and requires frequent type out of the entire answer after confidence has been asserted, to reassure the program of his good faith), and reminded of the fact if he forgets to use it when he should.

As a result, the program provides the learner with a procedural tool to assist him in the mastery of any details of a given verbally-oriented subject which he can cast into an appropriate CUE/RESPONSE format. The basic significance of SELFDRill lies precisely in the fact that it affords the learner this capability, which he may apply however he wishes.

LEARNER REACTION TO SELFDRill:

The amount of orientation required before a person can use SELFDRill in its present form is not excessive. As is often true for mechanical devices, the experience of using it is much simpler than verbal explanations of its use. While most of its users have had little or no skill as typists, this has not seemed to affect significantly their progress in learning to use the program, or its efficacy as a drill. The fact that in normal operation the computer does most of the typing, and the user comparatively little, helps to make this true.

Normally a learner's first exposure to the program consists of a supervised drill session at the teletype console. An introductory drill file containing the commands used by the program itself, together with a brief explanation of each, enables a person unfamiliar with computers or the program to master the process of creating drill files, punching or reading tapes, adjusting program timing, starting and stopping the drill process, and so on, within an hour or so of his first encounter with the machine and the program.

So far, the equipment has not been sufficiently accessible to produce statistically significant results. Some two dozen

persons have used the program seriously, but only three of these with reasonable regularity over an extended period. (Each drill session normally has involved a special trip from the college campus to the equipment installation two miles away). However, this initial period of limited use of the program has been crucial to its refinement; detailed comments and discussion on the part of several of its initial users have resulted in further improvements and guidance in the follow-on effort. Criticisms tend to focus on the more obvious mechanical limitations of the system. It therefore seems more meaningful to eliminate as many of these obvious shortcomings as possible before attempting a systematic evaluation. There is little point in swamping the legitimate criticism of the pedagogical methodology with avoidable reactions to the crudities of the particular equipment being used. It is therefore crucial at this point to find a more adequate user interface than the teletype, more satisfactory file storage than paper tapes, and location more convenient to users than the present one.

PEDAGOGICAL IMPLICATIONS OF SELFDRill:

The experimental use of SELFDRill has prompted me to do some serious thinking about the best way to explore its use more fully. On a certain fundamental level, very obvious to me as a teacher but less easy to verbalize, the program as it actually operates provides a radical (if incomplete) challenge to some of the attitudes and procedures traditional to this college, and probably to higher education more generally. In part these fundamental procedures concern the implicit sacrosanct status of the classroom experience. Quantity of learning tends still to be measured in terms of hours of class participation, for example. I do not see how that concept can be justified intellectually.

From another aspect, I see the commonly-accepted roles of both teacher and student as inadequate to the needs of learning.

The classroom is almost always the teacher's show. And yet in the nature of the case--because all of us learn by doing far better than by watching--the learner needs to be the protagonist of the learning encounter.

SELFDRill illustrates one way of putting the initiative in the hands of the learner himself. Development of this kind of learning resource is not a luxury, but is an urgent necessity for the kind of self-actualizing learner who can cope with modern existence. It is not enough for the educatior to try to motivate learners toward self-direction (the thrust of the "learning contract" approach); he has an obligation to develop workable modes of self-learning.

What distinguishes SELFDRill from other computer-based drill experiences is the fact that the learner is faced with the challenge of choosing appropriate items to learn. There is simply no way to compare such a general tool for reinforcement of recall with the usual types of programmed frames of instruction. To the best of my understanding, education for today and tomorrow must concentrate on helping the learner to formulate his own approach to materials with which he is unfamiliar. Until the CAI effort changes its focus from the teacher to the learner, it will never be a decisive factor in shaping the educational experience.

It is both possible and necessary for us to develop technological tools which will redirect the focus of education to the learner himself. In the process of developing and introducing such learning capabilities, we shall inevitably reshape the role of the learner and that of the teacher as well. SELFDRill is but the barest beginning of such reform.

A CRITIQUE OF THE BELOIT LEARNING ENVIRONMENT:

It is my conviction that Beloit College offers a good proving ground for the development and refinement of potentially revolutionary tools for learning such as SELFDRill and the LEARN

system. This belief is based on the degree of interest expressed in the project by faculty members and the administration, and by the school's record of innovation in many aspects of its curriculum and program. There is a certain healthy willingness on the part of most members of the community to engage in self-criticism and to explore new techniques and approaches.

At the same time, traditional roles of teacher and student are strongly entrenched. Some of the students at Beloit, like many other persons elsewhere, are genuinely interested in playing a more active role in determining the direction and character of their own learning experience. They find it a source of some frustration, judging from their many comments to me over the years, that teachers here have not given them sufficient opportunity or aid in doing so. SELFDRill (and eventually LEARN) could serve as one way of helping to create a new set of relationships between teacher and learner.

Already the limited use of SELFDRill has helped to point up one basic problem. Heretofore the learner was compelled to struggle--virtually apart from the aid of his teacher--with the problem of how to assimilate what his teacher thought was important. With SELFDRill--in some small measure, at least--he experiences some respite from that burden. With his increasing confidence in his own ability to recall a very respectable amount of specific information, the realization dawns upon him that in too many cases the teacher has not really communicated which specifics ought to be mastered. In fact, the burden rests upon the learner to figure out what is important to learn. This would not be such a bad thing were it not for the teacher's arbitrary power to make the examination an ex cathedra edict establishing what is "really" significant in the subject.

The most fundamental defect resulting from this imperfect level of communication between teacher and learner is not the injustice of the resultant evaluation (though this may be serious enough in particular cases), but is rather the ineffectiveness

of the learning encounter. Too much of the learner's time is wasted in efforts to "psych out" or humor his teacher. There is simply too great a psychological distance between learner and teacher, too little real dialogue between them about the total content of understandings which the learner is trying to develop in the specific subject under consideration. If some of the teachers at Beloit fail to realize that this is true, many of the brighter learners here certainly do. At the risk of overgeneralizing (since there are of course some notable exceptions), humanities-oriented education at Beloit and elsewhere seems to be plagued with a certain disillusionment and resignation on the part of most of the more capable students toward their courses. We who are teachers can rationalize this problem away by charging it up to the learner's growth in independent critical judgment ("he has to cut his intellectual teeth on something, and it might as well be our courses"), and we can take comfort in the fact that some students who leave Beloit in disillusionment ultimately return, convinced that they cannot find anything as good educationally elsewhere. For myself (and probably for many of my colleagues), these considerations are not entirely convincing.

A couple of specific instances of the dialogue relating to the application of SELFDRill at Beloit will serve to point up this uneasiness. (These are the most negative incidents encountered thus far, and should not be interpreted as a barometer of student response to SELFDRill, which has generally been very positive). In one case a young man previously unfamiliar with the program was invited to use it by some of the students active in the project. He sat down at the console, and within a few minutes was animatedly engaged in drilling on some Latin vocabulary (his acquaintance with Latin being very rudimentary). Asked afterward for his reactions, he admitted that he had enjoyed the experience and that he had learned; but said that he did not need such a facility to meet the faculty's expectations of him here at Beloit. His teachers, he felt, were impressed by his

ability to parrot their favorite ideas. And since he was intelligent and articulate, he was able to secure their approval by playing on their prejudices (or in his own terms, to "snow" them by "bullshitting"). He confessed to the lack of any sense of serious learning in his academic work here.

For him, the intellectual experience at Beloit was a game at which he happened to excel, but one which had little to do with genuine learning. College was simply a way of "jumping through the hoop" to earn one's intellectual license. I do not regard this student as typical; but he does point up a feeling which is too prevalent among students to be ignored.

Possibly more typical was the experience of a girl who used SELFDRill with items of her own choice to prepare for an examination in one of her more factually-oriented courses, in a field she was thinking of choosing as her major. She <u>did</u> learn a large number of specific facts; but she did poorly on the exam because her teacher focussed attention on items she considered too peripheral for inclusion in her drill file. (This student is now trying to decide whether or not she wants to continue her studies at Beloit; if she does, she will probably not major in the field in question, even though she is still interested in that discipline.

Thus there is disillusionment and frustration among students at Beloit (as in other schools), and some part of it is due to a communication problem between teacher and student. From my own initial experience in using SELFDRill in conjunction with course work, I can appreciate its value as an aid to the vital subject-oriented dialogue which needs to happen in learning. It is certainly conceivable that such a program could help to redefine the teacher's and the learner's role here at Beloit. It could put more of the basic responsibility for his performance (and its evaluation) into the hands of the learner, and free the teacher to become more the ally and informational

resource, and less the intellectual truant officer than present modes of securing learning seem to demand.

Teachers here normally spend time introducing, emphasizing, and dramatizing concepts; and in making up, administering, and grading examinations to determine how well the student has mastered the material of the course. If this time were spent instead on reviewing the files of items generated by the learner using SELFDRill, and in individual counselling, a much greater degree of subject-oriented dialogue between student and teacher would result. The crucial difference between such an approach and current practice would be the shift of the teacher's attention from the rhetoric of group presentation to the tutorial analysis of the individual's experience.

It should be self-evident that SELFDRill can not by itself provide an adequate basis for such dialogue in many subject areas, because this program does not lend itself to application to every kind of specific learning. Other methodologies of involvement are needed to complement SELFDRill. The LEARN package, as presently conceptualized, affords a number of different ways of going about the process of self-directed learning. It therefore seems appropriate to develop the remainder of the system before attempting any definitive evaluation of SELFDRill.

It also seems of critical importance to avoid imposing the approach of the LEARN system on students and teachers who might find its mechanics distasteful. Many persons, especially in the humanities, have negative feelings about the computer. Rightly or wrongly, it appears to them as the epitome of the overly-mechanistic thrust of present-day technology, and they see it as an inherently de-humanizing device. (in my judgment, this is simply not true, and the feeling exists only because the capabilities of the computer are poorly apprehended and even more poorly demonstrated in its current state of application. But persons who feel this way certainly deserve consideration). To

pressure any person--student or teacher--into using the computer is contrary to the best interests of the educational community and detrimental to the normal progress of educational technology.

In the hands of those who can see its role as a positive one, however, the computer can help to redefine the roles of teacher and learner in a way which can make learning more habitual and more effective in the world we face. The LEARN system is one attempt in this direction. Its strength lies in its generality; the system can be applied in different ways, and can support the efforts of persons with very different pedagogical outlooks.

At the same time, LEARN is open to all the objections and misapprehensions to which any novel approach is susceptible. Rigorous criticism of it should be encouraged--to improve the system, to expose its ultimate limitations, and to illuminate its strengths. Like any other human structure, LEARN is of course fallible. If it can be used in such a way as to help some persons achieve a more salutary awareness of the fallibility inherent in every conceivable structure, it will have served us well.

Ultimately, the efficacy of LEARN will depend on the willingness of learners who use it to accept a more aggressive role in apprehending and structuring the material under study. Teachers who become part of a LEARN-based effort will also have to accept a different role: personal dialogue demands an intellectual openness which the social structure of the classroom and the judgmental power of the teacher tends powerfully to inhibit. Most of all, the teacher will need the ability to listen more thoughtfully.

APPLICATION OF LEARN AT BELOIT:

Given an operational LEARN system as the fruitage of the current effort, I see as one of my follow-on tasks the application of this system within the Beloit College curriculum. The logical place

to initiate itsuse would seem to be in the independent study program (the 391, 392, 394 series courses listed in each department under the general title "Special Problems"). In such courses it is normal for the student (with more or less guidance from one or more faculty members) to develop his own approach to a subject or area, and to share the results of his efforts with his mentor in order to secure informed feedback about the validity of his efforts. LEARN would afford a logical vehicle for such self-directed study. Such a program should be purely voluntary for both the student and the faculty member, of course, and assistance from the LEARN Project staff should be available on call to the users. The system should also be available for occasional informal applications by learners involved in more traditional courses (for drilling on foreign language vocabulary, for example, or the generation of a term paper). A period of refinement of LEARN, based upon reactions and criticisms growing out of its use, should be assumed. Applications of the system in other institutions should also be explored. And finally, it is to be hoped that publication of information about LEARN and experimentation with its use will encourage the development of other innovative modes of application of the computer in learning.

HUMANITIES-ORIENTED CRITIQUE OF PRESENT-DAY CAI:

One basic significance of the Foundation's support of the development of LEARN lies in the degree to which this approach explores different assumptions from those pervasively present in currently popular approaches to computer aided instruction. Some of these prevalent assumptions are:

(1) There are particular "best" ways of developing conceptual understandings in any given subject. Effective learning is accopmplished by having an insightful teacher pilot each step of one's discursive exploration of any unfamiliar subject. Thus the "master teacher" is the key to education, and practically everyone profits more from such tutelage than from less directed kinds

of learning experience.

(2) One of the functions of the computer is to model the learner's behavior so as to provide intelligent interaction in the logical chain of exploratory study. If the system is big enough and sophisticated enough it can predict human response successfully.

(3) Education itself is fundamentally a matter of becoming familiar with the truth in various specific areas of human knowledge. Another function of the computer is therefore to dispense truth as defined by the writers of computer-based courses of study.

(4) Learning objectives are universals. All significant learning can therefore be measured by statistical comparisons, and learning effectiveness must be determined by the use of a control group.

(5) Learners are inherently lazy; and therefore "motivation of the learner" is the most crucial concern of the designer of educational tools. Translated into more general terms, this is the definition of education as society's attempt at moral reform of the individual.

Taken together, these assumptions constitute one way of looking at man. They are certainly not the only way. And particularly in those kinds of intellectual activity which come closest to exploring man's own self-awareness--in contrast to the development of systematic problem-solving tools--they are not an adequate way. This, it seems to me, is the most basic reason the computer has been neglected in the humanities. Until computer-based learning aids are freed from the limiting concepts which presently dominate the field, this neglect will continue. And all of us will be the losers. For self-insight is the most crucial product of education; and an education based on the assumptions just mentioned tends to blind learners to their basic responsibility and potential as human beings.

So while the LEARN project can not claim to be "the" answer to the shortcomings of CAI, it is significant because it is one

attempt to exploit the technology in the service of a learning environment based on a different set of assumptions, namely:

(1) Learning is a very personal activity. Any given teaching approach is inevitably wrong for certain persons. Thus the use of the computer will itself be wrong in some cases, and indeed the LEARN system itself should not be forced upon any learner.

(2) It is vital therefore to encourage the development of pluralistic ways of using the computer for learning, and to give learners at least a reasonable amount of latitude in choosing how they will use it.

(3) The goal of education is the development of self-learners, i.e., persons who have the ability to orient themselves in any unfamiliar situation.

(4) One learns self-orientation by practicing self-orientation.

(5) The learner interested in using the computer is quite capable of understanding its limitations and operating in terms of them.

(6) The computer is capable of accommodating the unique needs of the individual user in ways which traditional formal education is unable to conceive. It therefore requires fresh approaches not modelled on any form of classroom presentation or "course" organization, and not limited by traditional roles of teacher or learner. In fact, the computer can help to develop new, more effective roles for both.

(7) It is both possible and legitimate to develop generalized programs for learning parallel to those which are coming into existence for banking, documentation, instrumentation, and other particular fields of computer application.

(8) On the other hand, there is probably no way to make good learning painless; nor is there any point in creating distance between teacher and learner in the design of a learning environment. Whatever use is made of the computer should create more, not less, person-to-person substantive learning dialogue.

I would be very much surprised if there are not other assumptions in my approach, perhaps equally fundamental, of which I am not aware. Those I have mentioned will serve, however, to indicate something of my biases and direction. Dialogue about these assumptions is always welcome, particularly when it is well-informed about the project and sensitive to its basic concerns.

DISSEMINATION OF SELFDRill:

The following steps have been taken to make the results of this year's work available to potential users:

1. SELFDRill has been published as DECUS program 8-656. Documentation available from DECUS at nominal cost includes a paper tape version of the object program, a set of source tapes liberally annotated, complete program listings, program description, core map information and other notes useful to a programmer who might want to modify the program, and a complete user's guide.

2. Charles Mead of Digital Equipment Corporation published an article in EDU magazine (Fall 1973) describing SELFDRill.

3. Copies of the program were given to Bethel College (St. Paul, Minnesota) and Stevenson High School (Prairie View, Illinois) for experimental use. Both schools have tried the program, and their reactions are indicated in the appendix to this report.

4. The program was explained and demonstrated at a conference on the Improvement of Instruction in Smaller Classics Departments, held at Beloit College in June of 1973.

5. The program was announced, and information about it was provided to participants in a session on the Computer in the Classics held as part of the American Philological Society meeting in St. Louis December 28, 1973. As a result, I have made contact with David Packard and others at U.C.L.A. engaged in the development of a beginning Greek course appropriate to individualized study.

6. The program has been used at Beloit on a limited basis. As a result, plans are now being developed to provide a facility on campus to expand its use.

7. Descriptions and discussions of the program have been shared with several scholars: Stephen Waite of Dartmouth; David Hill of University of Calgary; Joseph Raben of Queens College (Editor of Computers in the Humanities); Nathan Greenberg of Oberlin; and Dr. Susan Gross, who is heading up a computer-based remedial reading project at Matteson, Illinois.

FURTHER DEVELOPMENT OF SELFDRill:

The investigator is currently planning a report and demonstration of SELFDRill at the Conference on the Computer in the Undergraduate Curricula to be held at Pullman, Washington in June of 1974. Part of the follw-on effort recently funded will consist of the exploration of various ways of improving SELFDRill. Results of this effort will be reported in conjunction with the total development of LEARN.